

88. OPTICS,
Lenses.

British



A.D. 1860, 13th OCTOBER. N° 2496.

Lenses.

LETTERS PATENT to Richard Archibald Brooman, of 166, Fleet Street, in the City of London, Patent Agent, for the Invention of "IMPROVEMENTS IN LENSES."—A communication from abroad by Charles C. Harrison, of New York.

Sealed the 12th April 1861, and dated the 13th October 1860.

PROVISIONAL SPECIFICATION left by the said Richard Archibald Brooman, at the Office of the Commissioners of Patents, with his Petition, on the 13th October 1860.

I, RICHARD ARCHIBALD BROOMAN, of 166, Fleet Street, in the City of
5 London, Patent Agent, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN LENSES," (communicated to me from abroad by Charles C. Harrison, of New York) to be as follows:—

This Invention consists in an improved construction of lens for optical instruments designed primarily for use in cameras for taking photographs,
10 daguerreotypes, and other pictures, but is also adapted to microscopes, telescopes, and similar instruments. The importance of obtaining a picture free from distortion in the camera is well known, as is also that of securing the largest field with any given aperture.

This improvement overcomes the difficulties hitherto experienced in each of

Brooman's Improvements in Lenses.

these points producing an image in which all the lines shall be parallel and the flat field, as well as enabling the use of an aperture capable of taking in a field, the extreme rays of which shall converge at so great an angle as ninety degrees without distorting the image. This is accomplished by making a compound lens consisting of an achromatic combination of two lenses, which 5 are meniscuses, the outer surfaces of which are segments of similar spheres, and which lenses are so placed in the combination that their axes shall coincide, and their outer surfaces form portions of a sphere of like diameter.

At *a* and *b* in the accompanying Drawings is shown an achromatic meniscus, *a* being a concavo-convex lens of crown glass, and *b* a meniscus of flint glass. 10 The outer surface of *a* is a portion of a sphere of any desired diameter. The outer surface of *b* and the inner surface of *a* will coincide, so that the two may be cemented together in a manner well known. Opposite to this a lens of like construction, *a*¹, *b*¹, is so placed that the axes of the two will coincide, and their surfaces if produced would form a complete globe, as indicated in Figure 1. 15 Now if the combination is properly made to insure perfect achromatism, it is clear that the focal point of each compound lens will be the centre of the sphere.

The operation will be as follows:—Any object being properly placed as *c* will be exactly reproduced on the opposite side as at *c*¹, and of the same size if 20 at the same distance, or of sizes proportional to the respective distances, for it is clear that whatever be the angle at which the rays are refracted to the centre *d* of the sphere, they will so pass out through the opposite lens as to restore the angle of incidence of the entering rays, and will thus unite to produce the image upon a plane parallel with that from which the incident 25 rays proceeded.

In Figure 2 the two lenses are shown as mounted for use, the representation being that of a longitudinal section in the plane of the axes of the lenses. A diaphragm is fitted centrally between the aperture, being shewn at *e*, and thus the whole forms the object glass of the camera. 30

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Richard Archibald Brooman in the Great Seal Patent Office on the 13th April 1861.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, RICHARD ARCHIBALD BROOMAN, of 166, Fleet Street, in the City of London, Patent 35 Agent, send greeting.

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WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Thirteenth day of October, in the year of our Lord One thousand eight hundred and sixty, in the twenty-fourth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Richard Archibald Brooman, Her special licence that I, the said Richard Archibald Brooman, my executors, administrators, and assigns, or such others as I, the said Richard Archibald Brooman, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN LENSES," (communicated to me from abroad by Charles C. Harrison, of New York,) upon the condition (amongst others) that I, the said Richard Archibald Brooman, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Richard Archibald Brooman, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, reference being had to the Drawings hereunto annexed, that is to say:—

This Invention consists in an improved construction of lens for optical instruments, designed primarily for use in cameras for taking photographs, daguerreotypes, and other pictures, but is also adapted to microscopes, telescopes, and similar instruments. The importance of obtaining a picture free from distortion in the camera is well known, as is also that of securing the largest field with any given aperture.

This improvement overcomes the difficulties hitherto experienced in each of these points, producing an image in which all the lines shall be parallel and the field flat, as well as enabling the use of an aperture capable of taking in a field, the extreme rays of which shall converge at so great an angle as ninety degrees without distorting the image. This is accomplished by making a compound lens consisting of an achromatic combination of two lenses which are meniscuses, the outer surfaces of which are segments of similar spheres, and which lenses are so placed in the combination that their axes shall coincide, and their outer surfaces form portions of a sphere of like diameter.

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At *a* and *b*, in the accompanying Drawings, is shown an achromatic meniscus, *a* being a concavo-convex lens of crown glass, and *b* a meniscus of flint glass. The outer surface of *a* is a portion of a sphere of any desired diameter. The outer surface of *b* and the inner surface of *a* will coincide, so that the two may be cemented together in a manner well known. Opposite to this, a lens 5. of like construction *a*¹, *b*¹, is so placed that the axes of the two will coincide, and their surfaces if produced would form a complete globe, as indicated in Figure 1. Now, if the combination is properly made to insure perfect achromatism, it is clear that the focal point of each compound lens will be the centre of the sphere. 10

The operation will be as follows:—Any object being properly placed as *c*, will be exactly reproduced on the opposite side as at *c*¹, and of the same size if at the same distance, or of sizes proportional to the respective distances, for it is clear that whatever be the angle at which the rays are refracted to the centre *d* of the sphere, they will so pass out through the opposite lens as to 15 restore the angle of incidence of the entering rays, and will thus unite to produce the image upon a plane parallel with that from which the incident rays proceeded.

In Figure 2, the two lenses are shown as mounted for use, the representation being that of a longitudinal section in the plane of the axes of the lenses. 20 A diaphragm is fitted centrally between the aperture being shewn at *E*, and thus the whole forms the object glass of the camera.

And having now described the nature of the said Invention and in what manner the same is to be performed, I declare that I claim, the construction of lenses for optical instruments in manner and for the purposes herein-before 25 described and illustrated in the accompanying Drawings.

In witness whereof, I, the said Richard Archibald Brooman, have hereunto set my hand and seal, this Thirteenth day of April, One thousand eight hundred and sixty-one.

R. A. BROOMAN. (L.S.) 30

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R. A. Brooman.

(See U.S. 35,605-
June 17, 1862.)

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FIG. 1.

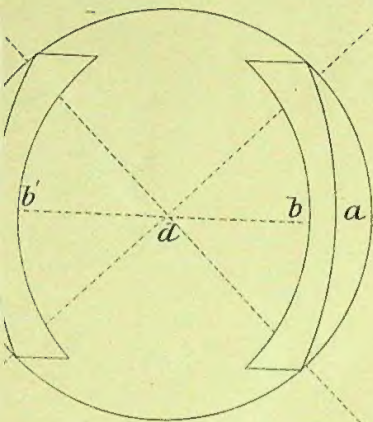
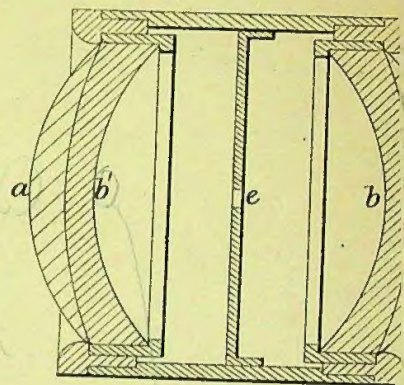


FIG. 2.



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